

CLAIMS

1. A method for detecting a halo surrounding an ultrasound image of a tumor, the steps comprising:

- a) locating the boundary of the tumor in the image;
- b) defining a first annular region surrounding the tumor and adjacent the tumor

5 boundary;

- c) defining a second annular region surrounding the tumor and adjacent the first annular region; and

- d) determining the presence of a halo by comparing the value of an image parameter of image pixels in the first annular region with the value of the image parameter of
10 pixels in the second annular region.

2. The method as recited in claim 1 which includes filtering the ultrasound image before performing step a).

3. The method as recited in claim 1 in which step d) includes:

- i) dividing the first and second annular regions into a plurality of sectors; and
- ii) comparing the average brightness of image pixels in each sector of the
5 first annular region with the average brightness of image pixels in the corresponding sector in the second annular region.

4. The method as recited in claim 3 in which the presence of a halo is determined by the number of sectors in which the average brightness of the first annular region is less than the average brightness of the second annular region.

5. The method as recited in claim 1 in which the image parameter is pixel brightness.

6. The method as recited in claim 2 in which the filtering performs at least one of the following operations on the ultrasound image: speckle reduction; edge enhancement; functional feature extraction; or texture feature extraction.

7. The method as recited in claim 1 in which the boundary of the tumor is located in step a) by manually designating a plurality of locations on the image and connecting the designated locations with lines that locate the tumor boundary.

8. The method as recited in claim 1 in which the boundary of the tumor is located in step a) by manually designating a plurality of locations on the image and locating the tumor boundary using the designated locations and an energy-minimizing snake process.

9. The method as recited in claim 1 which includes:
e) displaying an indication that the halo is present.

10. A system for indicating the presence of a halo surrounding an ultrasound image of a tumor, which comprises:

- a display for displaying said ultrasound image;
- means for identifying the tumor in the displayed ultrasound image and for locating its boundary;
- means for defining an inner annulus region of the displayed ultrasound image which surrounds the located boundary of the tumor;
- means for defining an outer annulus region of the displayed ultrasound image which surrounds the inner annulus region;

10 processor means for comparing image parameters in the inner annulus region with image parameters in the outer annulus region to determine the presence of a halo; and

means responsive to the processor means for indicating the presence of a halo.

11. The system as recited in claim 10 in which the means for identifying the tumor includes a mouse for moving a cursor on the display to designate a plurality of points on the tumor image boundary.

12. The system as recited in claim 10 in which the means for identifying the inner annulus region includes a stored value which indicates the number of pixels the inner annulus region extends outward from the located tumor boundary.

13. The system as recited in claim 12 in which the means for identifying the outer annulus region includes a stored second value which indicates the number of pixels the second annulus region extends outward from the inner annulus region.

14. The system as recited in claim 13 in which the second stored value is greater than twice the first stored value.

15. The system as recited in claim 10 in which the image parameters is brightness of the image pixels and the processor means includes:

means for dividing the inner and outer annulus regions into sectors which extend around the image of the tumor; and

5 means for comparing the average brightness of each inner annulus sector with the average brightness in the corresponding outer annulus sector.